

Intensification of Biodiesel Synthesis Reactor Using Biphasic Homogenous Catalytic Reaction: Parametric Study

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ABSTRACT

Parameters of extraction and reaction of biodiesel synthesis under partially immiscible liquid–liquid phase conditions were studied in a laboratoryscale, multiple stage, stirred, counter-current tubular reactor called a multistage stirred column (MSC). Ethanol was used as the excess reactant with refinedbleached-deodorized palm oil (RBDPO) feedstock and simultaneously acted as an extractant to biodiesel and glycerol in transesterification reaction catalyzed by 1.5 wt % potassium ethoxide. The molar ratios of RBDPO to ethanol of 1:6 and 1:12 obtained from their feed flows appeared as two liquid phases and the reactor was agitated at 200 and 300 rpm. Initial study of liquid mixing revealed nonlinear equilibria of ethyl oleate concentration with dynamic distribution coefficient between the two organic liquid phases. The batch reactor study optimized stirring speed and was set as a benchmarking. MSC study showed better efficiency, having a Damköhler number (Da) greater than unity ($27 \leq Da \leq 1688.9$).

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